

ARAC WG Report Format

1 - What is underlying safety issue addressed by the FAR/JAR? [REDACTED]

Loss of pilot view through flight deck transparencies in precipitation due to the environmental conditions or due to system failures can lead to unsafe conditions. The FAR/JAR 25.773(b) rules define design requirements for flight deck window heat and rain removal systems to ensure reliable and safe operation during these precipitation conditions.

2 - What are the current FAR and JAR standards? [REDACTED]

FAA REQUIREMENTS

14 Code of Federal Regulations 25.773

§ 25.773 Pilot Compartment View.

(b) Precipitation conditions. For precipitation conditions, the following apply:

(1) The airplane must have a means to maintain a clear portion of the windshield, during precipitation conditions, sufficient for both pilots to have a sufficiently extensive view along the flight path in normal flight attitudes of the airplane. This means must be designed to function, without continuous attention on the part of the crew, in-

(i) Heavy rain at speeds up to $1.6 V_{s1}$ with lift and drag devices retracted; and

(ii) The icing conditions specified in §25.1419 if certification with ice protection provisions is requested.

(2) The first pilot must have-

(i) A window that is openable under the conditions prescribed in paragraph (b)(1) of this section when the cabin is not pressurized, provides the view specified in that paragraph, and gives sufficient protection from the elements against impairment of the pilot's vision; or

(ii) An alternate means to maintain a clear view under the conditions specified in paragraph (b)(1) of this section, considering the probable damage due to a severe hail encounter.

[Amdt. 25-72, 55 FR 29778, July 20, 1990]

Advisory Circular No. 25.773-1 Pilot Compartment View Design Considerations.

Date: January 8, 1993

1. **PURPOSE.** This advisory circular (AC) sets forth a method for demonstrating compliance with the airworthiness standards for transport category airplanes pertaining to pilot compartment view. As with all AC material, it is not mandatory and does not constitute a regulation. It is for guidance purposes only.

2. **RELATED DOCUMENTS.**

a. **Federal Aviation Regulations (FAR).** The related sections of Part 25 include:

§ 25.237 Wind velocities

§ 25.773 Pilot compartment view

§ 25.775 Windshields and windows

§ 25.777 Cockpit controls (seat for pilots from 5'2" to 6'3" in height, in consideration of the design eye position).

b. **Industry Documents.** The following documents are available from the Society of Automotive Engineers, Inc. (SAE), 400 Commonwealth Drive, Warrendale, PA 15096:

ARP 268G Location and Actuation of Flight Deck Controls for Transport Airplanes.

ARP 4101/1 Seats and Restraint Systems for the Flight Deck.

ARP 4101/2 Pilot Visibility from the Flight Deck.

3. **BACKGROUND.**

a. On January 19, 1971, the FAA issued Notice of Proposed Rulemaking No. 71-2, Cockpit Vision and Cockpit Controls. This notice proposed amendments to the airworthiness standards for transport category airplanes that introduced comprehensive cockpit vision standards and changed the range of pilot heights used for the location and arrangement of cockpit controls. A majority of the commenters responding to Notice 71-2 objected to the proposed amendments. In general, the airplane manufacturers believed the proposed requirements were too stringent and exceeded the state-of-the-art, particularly with respect to the size of transparent panels, considering weight and structural strength necessary to provide clear vision in the specified areas. The manufacturing industry, represented by the Transport Airworthiness Requirements Committee (TARC) of the Aerospace Industries Association, maintained that the proposed size of the clear vision field was in excess of that required to meet the most important objective of the proposed standards. That objective was to provide optimum vision for avoidance of midair collisions in "see and be seen" conditions of flight. The committee carried out a computerized study program that considered 10,000,000 hypothetical cases of pairs of airplanes on collision courses considering reasonable airplane mixes of type, speed, flight path angles, bank angles, etc. In addition, all known available data from actual midair collisions, reported near misses, and USAF Hazardous Air Traffic Reports (HATR) were used.

b. The pilot compartment view that evolved from the TARC study was somewhat smaller and its area redistributed in comparison with existing CAM 4b.350 recommendations and those proposed in Notice 71-2. The FAA withdrew the proposed rulemaking based on the information presented. Subsequent to that withdrawal, the Society of Automotive Engineers Inc. (SAE), Committee S-7, adopted the TARC recommendation as Aerospace Standard AS 580B. The FAA has adopted the TARC/SAE pilot compartment view for this advisory circular. Some of the SAE criteria have been modified and adopted as guidance for validating the pilot compartment view. Users of this circular should bear in mind that the pilot compartment view described herein is that which the TARC study showed to be minimum for collision avoidance. Designers are urged to provide the maximum practicable capability in excess of this field of view.

c. It is the responsibility of the applicant to show by acceptable means that the proposed arrangement meets the requirements of accessibility and non-interference set forth by § 25.777. Designers and certification authorities are encouraged to refer to guidance in current Aerospace Recommended Practice ARP 268G and ARP 4101/1 (replaces AS 290B) for these considerations. These documents were also prepared by the SAE for use in conjunction with ARP 4101/2 (replaces AS 580B).

4. CRITERIA FOR PILOT COMPARTMENT VISIBILITY.

a. The flight deck windshield must provide sufficient external vision to permit the pilot to safely perform any maneuvers within the operating limits of the aircraft and, at the same time, afford an unobstructed view of the flight instruments and other critical components and displays from the same eye position. The following subparagraphs describe the minimum criteria for pilot compartment view. Aircraft designers and manufacturers should make every effort to build windshields that offer the pilot more external vision.

b. Design Eye Position. The design eye position is a single point selected by the applicant that meets the requirements of §§ 25.773(d) and 25.777(c) for each pilot station. Figure 1 depicts a design eye position and pilot compartment view for optimum collision avoidance potential for the left pilot seat. For the right pilot seat, all left/right dimensions are reversed.

Figure 1. Pilot Compartment View (figure not reproduced here)

Figure 2. Measurement of Angles (figure not reproduced here)

c. Clear Areas of Vision. The clear areas of vision should be determined by measurement of angles from the design eye position utilizing ambinoocular vision. Ambinoocular vision is the total area that can be seen by both eyes. It is not limited to the binocular field but includes, in addition, monocular regions visible to the right eye, but not to the left, and vice versa. Measurements are made as depicted in figure 2 with an

intraocular distance of 63.6 mm (2 1/2 inches) and utilizing rotational motion in a horizontal plane about a central axis 84 mm (3 5/16 inches) aft of the design eye position. These dimensions correspond to average cranial dimensions for humans. The horizontal and vertical vision angles should be measured from: (1) a vertical datum plane running fore and aft through the design eye point and central axis; and (2) a horizontal datum plane perpendicular to the vertical plane that also passes through the design eye point and central axis. The vertical and horizontal datum planes are fixed relative to the airplane and should be parallel to those corresponding to zero pitch and yaw angles for the airplane. With the design eye position located per paragraph 4b, the vision through the transparent areas should provide the following pilot compartment view:

- (1) Forward and up 35 degrees from the horizontal datum plane at 40 degrees left of the vertical datum plane, diminishing linearly to 15 degrees up at 20 degrees right.
- (2) Forward and down 17 degrees from the horizontal datum plane between 30 degrees left and 10 degrees right of the vertical datum plane, diminishing linearly to 10 degrees down at 20 degrees right.
- (3) Forward and up 35 degrees from the horizontal datum plane between 40 degrees left and 80 degrees left of the vertical datum plane, diminishing linearly to 15 degrees up at 120 degrees left.
- (4) Forward and down 17 degrees from the horizontal datum plane at 30 degrees left of the vertical datum plane, diminishing linearly to 27 degrees down at 70 degrees left.
- (5) Forward and down 27 degrees from the horizontal datum plane between 70 degrees left and 95 degrees left of the vertical datum plane, diminishing linearly to 15 degrees down at 120 degrees left.

d. Landing Vision. In addition to the requirements of paragraph 4c, the view angle forward and down should be sufficient to allow the pilot to see a length of approach and/or touch-down zone lights that would be covered in three seconds at landing approach speed when the aircraft is:

- (1) On a 2 1/2 degree glideslope.
- (2) At a decision height that places the lowest part of the aircraft at 30.5 m (100 feet) above the touch-down zone extended horizontally.
- (3) Yawing to the left to compensate for ten knots crosswind.
- (4) Loaded to the most critical weight and center of gravity.
- (5) Making the approach with 366 m (1200 feet) runway visual range (RVR).

e. Obstructions to Vision.

(1) There should be no obstructions to vision between 20 degrees right and 20 degrees left in the vision polar depicted by figure 1. Obstructions outside this 40 degree area should be kept to a minimum; ideally not more than three (i.e., center post, forward post, and side post). Using ambinoocular vision, it should be possible for a pilot to have vision of any given bearing that is blocked to the other pilot from 80 degrees right to 80 degrees left of the design eye position. In addition, it is desirable that obstructions be eliminated by using ambinoocular vision with the average human intraocular dimensions of 63.6 mm (2 1/2 inches). This would require that the projected width of the obstruction be no greater than the intraocular dimension. It should be possible for the pilot to eliminate any obstruction to vision using ambinoocular vision with head movement of 13 mm (1/2 inch) left and right. In the example depicted in figure 2, head movement to the left would eliminate the obstacle. Use of sun visors that reduce light transmissivity are acceptable; however, totally opaque visors that impinge upon the field of view of figure 1 should not be used.

(2) Windows and windshields that have become deteriorated in service are considered to be airworthy only if the pilot compartment view is not impaired below the criteria set forth in paragraph e(1).

f. Optical Properties. The windshield should exhibit optical properties equivalent to those specified in MIL-P-25374B for plastic windows, and MIL-G-25871B for glass or glass-plastic windows. These documents contain information on laminate construction, optical uniformity, luminous transmittance, physical properties, environmental exposure, etc.

g. Precipitation. Precipitation clearing should be provided for the windshield panels directly forward of each pilot and should be effective at all thrust settings up to at least 1.6 V, (clean) or 230 knots, whichever is less. The minimum area to be cleared should be 15 degrees left to 15 degrees right of the design eye position, upward to the horizon during the steepest approach path expected in operation, and downward to the limits recommended in paragraph 4c. If windshield wipers are used, wiper speeds of approximately two sweeps per second have been found to be satisfactory in maintaining a cleared area.

h. Compliance Considerations. A method traditionally used for showing compliance with the ~~viewing~~ requirements has been a somewhat exotic camera system. Other methods are also allowed, including 3-D graphics systems and simple surveying equipment. The formation of the vision boundaries described in this advisory circular is based on flight at subsonic speeds. Any aircraft featuring variable nose geometry, or those capable of making STOL/VSTOL steep approaches, should be subject to special compliance considerations.

JAA REQUIREMENTS

JAR 25.773 Pilot compartment view

(b) Precipitation conditions. For precipitation conditions, the following apply:

(1) The aeroplane must have a means to maintain a clear portion of the windshield during precipitation conditions, sufficient for both pilots to have a sufficiently extensive view along the flight path in normal flight attitudes of the aeroplane. This means must be designed to function, without continuous attention on the part of the crew, in—

(i) Heavy rain at speeds up to $1.6 [V_{S(1)}]$, with lift and drag devices retracted; and]

(ii) The icing conditions specified in JAR 25.1419 if certification with ice protection provisions is requested. (See ACJ 25.773(b)(1)(ii).)

(2) No single failure of the systems used to provide the view required by sub-paragraph (b)(1) of this paragraph must cause the loss of that view by both pilots in the specified precipitation conditions.

[(3) The first pilot must have --

(i) A window that is openable under the conditions prescribed in subparagraph (b)(1) of this paragraph when the cabin is not pressurised; provides the view specified in that paragraph, and gives sufficient protection from the elements against impairment of the pilot's vision; or

(ii) An alternate means to maintain a clear view under the conditions specified in sub-paragraph (b)(1) of this paragraph, considering the probable damage due to a severe hail encounter.]

(4) The openable window specified in sub-paragraph (b)(3) of this paragraph need not be provided if it is shown that an area of the transparent surface will remain clear sufficient for at least one pilot to land the aeroplane safely in the event of—

(i) Any system failure or combination of failures which is not Extremely Improbable under the precipitation conditions specified in sub-paragraph (b)(1) of this paragraph.

(ii) An encounter with hail, birds or insects.

[Change 14 27.5.94]

Advisory Circular Joint (ACJ) 25.773(b)(1)(ii) - Pilot Compartment View (Acceptable Means of Compliance)

See JAR 25.773(b)(1)(ii)

For windshields protected by the application of electrical heat, a nominal heating capacity of 70 W/dm² would be adequate.

In mid-1998 the JAA released a Notice of Proposed Amendment (NPA) 25D-269 intended to clarify JAR 25.773(b). The NPA would have partially harmonized the JAR and FAR requirements by deleting JAR 25.773(b)(4) and making other minor wording changes. It would also have introduced a new Advisory Circular Joint (ACJ) 25.773(b)(3)(ii). The NPA was circulated for comments within the JAA but is now on hold pending the outcome of this ARAC working group effort, and it is anticipated that the proposed NPA will be superseded by the proposed harmonized FAR/JAR standard presented herein.

3 - What are the differences in the standards and what do these differences result in?:

[REDACTED]

The first difference in FAR and JAR 25.773(b) is in subparagraph (b)(1)(ii). The actual requirement statement is the same, that is to meet the icing requirements of FAR/JAR 25.1419 for windshield visibility. JAR 25.773(b)(1)(ii), however, refers to ACJ 25.773(b)(1)(ii), which supplements JAR 25.773(b)(1)(ii) by specifying a nominal heating capacity of 70 Watts per square decimeter as a means of compliance. Although the JAR provides additional information and a means of compliance, it is not necessarily more stringent than the FAR, because both the FAR and the JAR refer back to 25.1419, which in turn refer to FAR/JAR Appendix C meteorological icing envelopes. These envelopes contain icing conditions for which a particular windshield or transparency design, using the power density of 70 W/dm² specified in the ACJ, may not provide adequate anti-icing heat. Therefore, the FAR and JAR are actually more stringent by referring to Appendix C and not to the ACJ.

The next, and much more significant, difference in terms of compliance and aircraft design, is JAR 25.773(b)(2), which is an additional requirement, not equivalent with FAR 25.773(b)(2). The JAR adds the requirement that no single failure of the system specified in 25.773(b)(1) i.e. the rain removal system, can lead to a loss of pilot view through both windshields. The effect of this requirement on airplane design is that separate, mechanically and electrically independent windshield wiper systems must be provided, including separate flight deck control switches for left and right windshield wipers. In this case, the JAR is more stringent than the FAR, and provides for an increased system reliability, and an increased level of safety.

FAR 25.773(b)(2) is equivalent to JAR 25.773(b)(3). There are no design or compliance differences between these two sections.

The final difference is the addition of JAR 25.773(b)(4), which is unique and does not have an equivalent FAR. This section, which allows for an alternative to an openable side window required in the previous section, can be interpreted to be redundant with FAR 25.773(b)(2)(ii) and JAR 25.773(b)(3)(ii), but provides more detail to the requirements. JAR 25.773(b)(4) contains two subparagraphs. JAR 25.773(b)(4)(i) allows relief for the openable side window if it can be demonstrated that sufficient pilot view is still provided, even in the event of a failure or combination of failures of the rain removal system, where the failure(s) is not extremely improbable. This basically implies that if there is a dual windshield wiper system failure (which is typically not extremely improbable), the openable side window is still not required if adequate vision can still be maintained through the windshield or side window. This is more restrictive than the FAR because the alternate means of vision in the FAR could be interpreted to be the windshield wipers, whereas the JAR considers that the wipers may be failed so they cannot be the alternate means of visibility.

In terms of advisory material relative to the FAR and JAR standards, the FAA AC 25.773-1 provides extensive definition of what constitutes sufficient pilot visibility through the windshield. The JAR does not have equivalent advisory material. The AC also includes suggested means of compliance for windshield wiper speed. The ACJ, as previously mentioned however, includes suggested means of compliance for window heat system performance, which is not covered in the AC.

4 - What, if any, are the differences in the means of compliance? [REDACTED]

The only difference in compliance with FAR/JAR 25.773(b) is the addition of a second wiper switch, based on the additional JAR requirement in JAR 25.773(b)(2). Compliance to the FAR can be demonstrated with only one wiper switch to control both left and right wipers, but the JAR specifically requires provisions to preclude the potential failure of both systems due to a single fault. Therefore, the system design is driven to have separate left and right wiper switches in addition to separate motors.

The reference to hail, birds and insects in JAR 25.773(b)(4) has not been specifically demonstrated in any manner different than that for FAR 25.773(b)(2)(ii), which only specifies severe hail. Compliance to FAR 25.773(b)(2)(ii), JAR 25.773(b)(4)(i) and 25.773(b)(4)(ii) has typically been demonstrated by compliance statement, system description or analysis only.

5 - What is the proposed action? [REDACTED]

The proposed action is to merge the requirements of both FAR and JAR rules, to compare these requirements with industry standards and to simplify the rule by using the industry

standards which have resulted in systems that have been demonstrated safe by service experience. The harmonized rule will combine the requirements of FAR 25.773(b) and JAR 25.773(b) into one harmonized rule and eliminate the need for the ACJ 25.773(b)(1)(ii). This method was chosen after an investigation of rule contents and applications of JAR 25.773(b) and ACJ 25.773(b)(1)(ii) in state-of-the-art-design. The harmonized rule is in line with industry standards which have resulted in systems that have been demonstrated safe by aircraft certifications and service experience.

It is also recommended that the AC 25.773-1 be retained with no changes. The AC supplements the FAR while not contradicting the JAR. It contains extensive details on sufficient pilot visibility through the windshield, but does not go into detail in the areas that are affected for harmonization of the FAR and JAR.

The resulting harmonization will incorporate the more stringent requirements of the JAR but will include simplified wording to make the new rule easier to understand and less likely to be misinterpreted.

6 - What should the harmonized standard be? [REDACTED]

25.773 Pilot compartment view

(b) Precipitation conditions. For precipitation conditions, the following apply:

(1) The airplane must have a means to maintain a clear portion of the windshield during precipitation conditions, sufficient for both pilots to have a sufficiently extensive view along the flight path in normal flight attitudes of airplane. This means must be designed to function, without continuous attention on the part of the crew, in--

(i) Heavy rain at speeds up to $1.6 V_{S1}$, with lift and drag devices retracted; and

(ii) The icing conditions specified in [FAR or JAR] 25.1419 if certification with ice protection provisions is requested.

(2) No single failure of the systems used to provide the view required by sub-paragraph (b)(1) of this paragraph must cause the loss of that view by both pilots in the specified precipitation conditions.

(3) The first pilot must have a window that is openable under the conditions prescribed in subparagraph (b)(1) of this paragraph when the cabin is not pressurized, provides the view specified in that paragraph, and gives sufficient protection from the elements against impairment of the pilot's vision.

(4) The openable window specified in sub-paragraph (b)(3) of this paragraph need not be provided if it is shown that an area of the transparent surface will remain clear sufficient for at least one pilot to land the airplane safely in the event of--

(i) Any system failure or combination of failures which is not Extremely Improbable, in accordance with [FAR or JAR] 25.1309, under the precipitation conditions specified in sub-paragraph (b)(1) of this paragraph.

(ii) An encounter with severe hail, birds or insects.

The AC 25.773-1 should be retained with no revisions; the ACJ 25.773(b)(1)(ii) should be eliminated.

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [REDACTED]

The new FAR/JAR ruling clearly defines design and compliance criteria for pilot visibility through flight deck transparencies in one rule without relying on separate documents. It incorporates the more stringent of the existing FAA/JAA rules, and the harmonized rule merges existing proven requirements and industry standards which have resulted in safe aircraft systems with proven service experience.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [REDACTED]

The level of safety will be improved for those airplane systems and equipment previously certified only to the requirements of the FAA. System failure conditions and requirements to address loss of both windshield wipers have been incorporated by harmonization of the FAR and JAR rules to increase the level of safety by eliminating the potential for a single wiper switch failure leading to the loss of pilot visibility through both flight deck windshields.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [REDACTED]

The proposed standard maintains the same level of safety relative to current industry practice on newly certified aircraft which have two separate and independent windshield wiper switches, and would therefore be in compliance with the proposed standard.

10 - What other options have been considered and why were they not selected? [Explain what other options were considered and why they were not selected (e.g., cost/benefit, unworkable, etc.)]

One option would be to adopt the JAA Notice of Proposed Amendment to JAR 25.773(b). The NPA, however, would only partially harmonize the JAR and FAR requirements by deleting JAR 25.773(b)(4) and making other minor wording changes. It would also introduced a new Advisory Circular Joint 25.773(b)(3)(ii) which is more confusing than the proposed harmonization herein and does not improve safety. The NPA was circulated for comments within the JAA and is now on hold pending the outcome of this ARAC working group effort. It is recommended that the proposed NPA be superseded by the proposed harmonized FAR/JAR standard presented herein.

The only other option would be to harmonize the FAR and JAR by adopting the less stringent FAR and compromise the enhanced safety inherent in the JAR; therefore, this option was rejected. Simplification would be an option, by eliminating the AC as well as the ACJ, but the AC does add important criteria for defining sufficient pilot visibility. The AC also contains guidance material that is relevant to three other FARs; therefore, it should be retained with no revision.

11 - Who would be affected by the proposed change? [redacted]

Airplane manufacturers and suppliers will benefit from the single well-defined harmonized ruling reducing certification costs. Airplane manufacturers will need to design for two separate and independent windshield wiper switches. Airline operators may be negatively impacted from the standpoint of flight deck and crew interface commonality if they operate mixed fleets of previously certified aircraft with a single wiper switch activating both wipers, but will benefit from the enhanced safety inherent in the proposed standard.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [redacted]

In terms of advisory material relative to the FAR and JAR standards, the FAA AC 25.773-1 provides extensive definition of what constitutes sufficient pilot visibility through the windshield; therefore, it should be retained but does not need to be revised for harmonization of FAR/JAR 25.773(b). The JAR does not have equivalent advisory material. The AC also includes suggested means of compliance for windshield wiper speed. The ACJ 25.773(b)(1)(ii), however, includes suggested means of compliance for window heat system performance, which is not covered in the AC, but as previously discussed, the ACJ is not necessarily more stringent than the JAR reference to Appendix C and should therefore be eliminated in the harmonized standard.

Additionally, the preamble should include the following:

PREAMBLE

SUMMARY: This notice proposes to revise the requirements for pilot compartment view in precipitation conditions. This action is in response to the Aviation Rulemaking Advisory Committee (ARAC) Mechanical Systems Harmonization Working Group recommendation to harmonize paragraphs 25.773(b) of the Joint Aviation Requirements (JAR) with part 25.773(b) of the Federal Aviation Regulations (FAR).

BACKGROUND

On November 26, 1999 the FAA issued in the Federal Register a Notice of a new task to harmonize §25.773(b) with JAR Paragraph 25.773(b). The notice was issued to inform the public that the FAA has asked ARAC to provide advice and recommendations on harmonization of the FAA regulations and JAA requirements for pilot compartment view in precipitation conditions. This Notice of Proposed Rulemaking proposes a new pilot compartment view rule that has been harmonized to satisfy both the FAA and JAA.

General Discussion:

The intent of this rule is to combine the requirements of section 25.773(b) of the Federal Aviation Regulations (FAR), and paragraph 25.773(b) of the Joint Aviation Requirements (JAR), and the advisory material for paragraphs 25.773(b) of the JAR into one rule. The rule format is similar to the existing material for JAR 25.773(b). This rule applies to flight deck ice and rain protection systems, specifically flight deck window heat and windshield rain removal systems and their elements.

For the purpose of this rule-

- the flight deck window heat system elements include the front windshields and side windows, electrical control components and the associated wiring and flight deck switches.
- the windshield rain removal system elements include the front windshield wipers, pneumatic air diffuser "jet blast" components, windshield chemical repellent coatings or dispensing components, electrical control components and the associated wiring and flight deck switches.

This rule has been changed to harmonize and clarify FAR 25.773(b) and JAR 25.773(b). The current version of paragraph 25.773(b) of the JAR is more stringent than §25.773(b) of the FAR by requiring provisions for rain removal during potential system failure conditions. The proposed changes in the rule reflect current airplane manufacturer design practices for some commercial transport models where current designs are already intended to meet the JAR 25.773(b); however, all models not currently certified by the JAA would be affected by the rule harmonization. The AC 25.773-1 provides guidance material defining sufficient pilot visibility through the windshield and will be retained

with no revisions. The ACJ 25.773(b)(1)(ii) does not impose any further restrictions beyond what is already considered in current airplane manufacturing design practices. Harmonization of FAR 25.773(b) and JAR 25.773(b) is not affected by the proposed removal of ACJ 25.773(b)(1)(ii).

Proposed Rule Discussion:

Paragraph (b)(1)(i) of the proposed, harmonized rule is written to define the applicable requirements for rain removal systems to provide adequate pilot visibility through the flight deck windshields. The rule defines the worst-case airplane flight condition and environmental precipitation conditions which must be considered when demonstrating compliance with the requirement.

Paragraph (b)(1)(ii) of the proposed, harmonized rule is written to define the applicable requirements for window heat (i.e. anti-icing) systems to provide adequate visibility through the flight deck windshields. The rule does not specifically address the airplane flight or environmental precipitation conditions which must be considered when demonstrating compliance with the requirement. Instead, the rule refers to FAR/JAR 25.1419, which provides definition of the icing environment (through further cross-reference to FAR/JAR 25 Appendix C continuous maximum and intermittent maximum icing envelopes). Therefore, the specific design parameters to be considered in showing compliance with Paragraph (b)(1)(ii) must be sufficiently adequate to meet to FAR/JAR 25.1419.

Paragraph (b)(2) of the proposed, harmonized rule is written to define the applicable redundancy requirements for rain removal systems. Specifically, this paragraph ensures that the design must have adequate redundancy such that system failures may not cause loss of adequate pilot visibility through the flight deck windshields. The primary implication of this requirement is that windshield wiper (or other mechanical means of rain removal) systems must have separate and independent control switches.

Paragraph (b)(3) of the proposed, harmonized rule is written to define the applicable requirements for openable flight deck side windows which must not only be openable, but must also meet the requirements for adequate visibility in the precipitation (i.e. rain) conditions of (b)(1). In addition, the visibility through the openable side windows must account for "sufficient protection from the elements", which should be interpreted to mean fog on the internal surface of the window. Additionally, ice protection should be considered, unless it is shown that the side window is not subject to external icing.

Paragraph (b)(4) of the proposed, harmonized rule is written to define the applicable requirements for alternative means of compliance with the requirement in Paragraph (b)(3) for openable flight deck side windows. Specifically, openable side windows may not be required if adequate flight deck window visibility can still be demonstrated even in the event of failures classified as more probable than Extremely Improbable, and also including encounters with severe hail, birds or insects.

Extremely Improbable is defined by the probability of a system failure which would have a catastrophic effect, thereby endangering the continued safe flight and landing of the aircraft by causing loss of life or loss of the aircraft.

The AC 25.773-1 does not specifically deal with compliance to the proposed rule, other than a suggested means of compliance with windshield wiper performance; nevertheless, it does provide guidance on sufficient pilot visibility through the windshield, and should be considered when demonstrating compliance with the proposed, harmonized rule.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [REDACTED]

material [REDACTED]
Also, [REDACTED]
containing [REDACTED]

As previously mentioned, AC 25.773-1 will be retained with no revisions for the harmonized ruling. ACJ 25.773(b)(1)(ii) will be eliminated.

14 - How does the proposed standard compare to the current ICAO standard? [REDACTED]

Due to their commitments as ICAO members, the US and all JAA-countries converted ICAO requirements into their airworthiness codes. So both the JAR and FAR 25 at least fulfill the ICAO minimum standards. As the proposed standard does not decrease the level of safety of FAR or JAR25, it is in line with ICAO Annex 8 "Airworthiness of Aircraft".

15 - Does the proposed standard affect other HWG's? [REDACTED]

Yes; the Ice Protection Harmonization Working Group may have to review the proposed harmonized standard.

16 - What is the cost impact of complying with the proposed standard? [REDACTED]

The proposed new standard will reduce the overall cost and time of the joint certification process. Most current aircraft designs accommodate the JAR, which is currently more stringent than the FAR. The primary in design cost would typically be the installation of a second windshield wiper switch. An increase in certification costs may result to those manufactures applying only for FAA type certificate since they would typically not need

to install a second wiper switch; but this is a minimal cost driver if the system is initially designed to comply with the proposed new standard. These costs are not considered significant.

17 - Does the HWG want to review the draft NPRM at "Phase 4" prior to publication in the Federal Register?

Yes.

18 - In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain.

[REDACTED]

The "Fast Track" process is appropriate.

ARAC WG Report Format
Category 1 Items

1 - What is underlying safety issue addressed by the FAR/JAR? [REDACTED]

This requirement establishes the minimum design standard for trim indication systems. The intent of this standard is to provide accurate direction and position indication in relation to the airplane motion to the flight crew when the trim system is in operation.

2 - What are the current FAR and JAR standards? [REDACTED]

Current FAR text:

§ 25.677 Trim Systems.

(b) There must be means adjacent to the trim control to indicate the direction of the control movement relative to the airplane motion. In addition, there must be clearly visible means to indicate the position of the trim device with respect to the range of adjustment.

Current JAR text:

JAR 25.677 Trim Systems.

(b) There must be means adjacent to the trim control to indicate the direction of the control movement relative to the aeroplane motion. In addition, there must be clearly visible means to indicate the position of the trim device with respect to the range of adjustment. The indicator must be clearly marked with the range within which it has been demonstrated that take-off is safe for all centre of gravity position approved for take-off.

3 - What are the differences in the standards and what do these differences result in?:

JAR 25.677(b) added a requirement to clearly mark a range on the trim indication system where take-off is safe for all center of gravity positions.

4 - What, if any, are the differences in the means of compliance? [REDACTED]

The applicant must mark safe take-off limits on the trim indication system.

5 - What is the proposed action? [REDACTED]

Adopt the JAR text in the Code of Federal Regulations 14 Part 25 Section 25.677(b). The JAR text will be added to the FAR text. trim indication system limits for all center of gravity positions where it is shown to be safe for take-off will be added to FAR 25. 677(b).

6 - What should the harmonized standard be? [REDACTED]

§ 25.677 Trim Systems.

(b) There must be means adjacent to the trim control to indicate the direction of the control movement relative to the airplane motion. In addition, there must be clearly visible means to indicate the position of the trim device with respect to the range of adjustment. The indicator must be clearly marked with the range within which it has been demonstrated that take-off is safe for all center of gravity position approved for take-off.

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [REDACTED]

The proposed standard still addresses the safety issue in item #1. The proposed changes will be changed from the current rule by adding a new requirement that will effectively be a new minimum standard.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [REDACTED]

The proposed standard will increase the level of safety by adding a new requirement to mark safe take-off limits on the trim indication system.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [REDACTED]

The proposed standard will maintain the same level of safety as current industry practice. Most airplanes certified under current requirements already mark safe take-off limits on trim indication systems to show compliance to JAR 25.677.

10 - What other options have been considered and why were they not selected?: [REDACTED]

This is a simple change to the current standard. The change will harmonize Section 25.677 of the FAR with JAR 25.677. No other option was considered because of the simple change to the rule.

11 - Who would be affected by the proposed change? [Identify the parties who would be materially affected by the rule change: airplane manufacturers, airplane operators, etc.]

New Type Certificate Applicants.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does the existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

No Advisory material exists for this rule. New advisory material is not proposed for this rule.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted?

New advisory material is not proposed for this rule.

14 - How does the proposed standard compare to the current ICAO standard?

No ICAO standard exists for "Trim Systems".

15 - Does the proposed standard affect other HWG's?

The proposed rule for 25.677 does not affect other HWGs.

16 - What is the cost impact of complying with the proposed standard?

The proposed change will not increase manufacturing or operation costs.

17 - Does the HWG want to review the draft NPRM at "Phase 4" prior to publication in the Federal Register?

The MSHWG requests to review the draft NPRM at "Phase 4" prior to publication in the Federal Register.

18 – In light of the information provided in this report, does the HWG consider that the “Fast Track” process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain.

negative attitude in the past and present and thought of him as a "harmful" person.

This is a good candidate for the "FAST TRACK" process because the proposed change is not a controversial or complex change to the regulations.